

TECHNICAL NOTE

Transportation Air Quality Technical Support Interagency Contract with Texas Natural Resource Conservation Commission

TO: Mary McGarry-Barber, Project Manager
Texas Natural Resource Conservation Commission

DATE: 31 August 2002

FROM: Dennis G. Perkinson, Ph.D.
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SUBJECT: Supplemental Vehicle Classification Data Collection and Analysis for the
Houston Area - **Revised Final** (Umbrella Contract 9880077500-14: Task 3)

BACKGROUND

The Texas Natural Resource Conservation Commission (TNRCC) works with local planning districts, the Texas Department of Transportation (TxDOT), and the Texas Transportation Institute (TTI) to provide on-road mobile source inventories of air-quality pollutants. TxDOT typically funds transportation conformity determinations required under 40 CFR part 93, and the TNRCC typically funds mobile source inventory work in support of Federal Clean Air Act requirements for attainment of the National Ambient Air Quality Standards (NAAQS, 42 USCA 7409). Although there is already an approved State Implementation Plan (SIP) for the Houston-Galveston Area (HGA), SIP updates are planned in response to agreements made with Houston area stakeholders and based upon the SIP approach to reach attainment, mid-course review.

To obtain the most meaningful results, SIP updates should use the best possible data for the development of the emissions inventories. Ground count data for weekends is not regularly collected as part of Texas transportation planning. Therefore, weekend data, which is needed to calculate temporal allocations for attainment demonstration modeling inventories, is collected by TNRCC as a contracted inventory project. Updated data and methodologies are needed to ensure that the temporal allocations being used in Texas photochemical modeling is based upon current travel patterns. This task is for the deployment of vehicle classification count data collectors to obtain updated weekday, Friday, Saturday, and Sunday field data for the Houston-Galveston ozone nonattainment area. This task includes data collection in July and August of 2002. Some analysis of the data has been completed. However, since September data is required to complete this project, and since the TNRCC fiscal year ends in August, complete data collection and updated vehicle miles of travel (VMT) mixes will be calculated when the project is completed under a second phase task beginning September 2002 using Fiscal Year 2003 funding.

Specifically, this task used ground count data collectors to obtain updated weekday, Friday, Saturday, and Sunday vehicle classification field data for the Houston-Galveston ozone nonattainment area. Data were collected in July and August of 2002. Some analysis of the data has been completed. Since September data is required in order to complete this project, complete data analysis and updated VMT mixes will be calculated when the project is completed in Fiscal Year 2003. The following specific activities were completed under this task.

- Ground count data collectors were used to obtain weekday, Friday, Saturday, and Sunday field data for the Houston-Galveston ozone nonattainment area in July and August of 2002.
- Data analysis was performed, as appropriate, with the incomplete (July - August) data set.
- Documentation was prepared, complete and self contained, including electronic data files, consistent in format and level of detail with previous TTI reports.

Task Deliverables

Interim deliverables are an informal Technical Note (a narrative in memorandum format that explains the task, the approaches used, and the findings) provided to the Project Manager in WordPerfect 6/7/8 format, which is supported by electronic document files. All pertinent data are being submitted in specified electronic format. (There is no FORTRAN source code or executable files developed under this task.) CD-ROM or other electronic media is used to record the final data and supporting documentation. TTI is providing five copies of the final report. One of the copies is an unbound original suitable for copying. Electronic copies of all materials related to the task report, to document results and conclusions (e.g., data, work files, text files, etc.), or developed as work products under this contract are provided as requested by TNRCC.

INTRODUCTION

Transportation professionals have long recognized that good data is the cornerstone of transportation planning, research, and analysis. Current air quality regulations and procedures require planners to address transportation and environmental issues with a precision and accuracy that challenges the capabilities of the data and methods in use today. The models and other analytical tools used to provide these analyses are only as good as the data fed into them.

TxDOT maintains vehicle classification data collection sites throughout Texas. Recent TxDOT vehicle classification data collection for the 11 COAST counties contained 124 directional sites, 58 of which are in Harris County. These data are collected on an ongoing basis and are available hourly, but only for weekdays (Monday through Thursday). Thus, there are no weekend vehicle classification data. Where specific non-weekday episodes have been analyzed (e.g., Friday, Saturday, or Sunday), TTI has collected supplemental weekend vehicle classification data (or used approximations of weekend VMT mix based on weekday versus weekend relationships from areas with supplemental data.)

Supplemental vehicle classification counts were made by TTI at 30 sites during August and September 1993. Similar supplemental vehicle classification count data were collected by TTI in Harris County at 56 bi-directional sites in July 1998. These data are now nine and four years old, respectively. Consequently, current vehicle classification data need to be supplemented to include Friday, Saturday, and Sunday as well as weekday. Supplemental vehicle classification data was collected at selected Houston area sites for the period July through August (with September data collection and analysis of the entire data set provided for under a separate work order).

Table 1 shows those supplemental data collection sites for which data have been collected for this task in the context of the entire set of identified collection sites. This partial data has been analyzed and VMT mix estimated using the sites shown in Table 2. These results are shown in Tables 3 and 4. Note that these results are based on incomplete data and are therefore not representative. Several technical issues remain to be resolved once data collection is complete and the entire data set is available for analysis (e.g., the use of partial days and partial sites).

Once complete, the entire data set will be the basis for developing updated day-of-week factors that can be applied to larger weekday only data sets to estimate Friday, Saturday and Sunday VMT mix. Raw count data files are provided electronically as specified in the associated Work Order.

Table 1
Supplemental Vehicle Classification Data Collection Site List

OBS	COUNTY	FC	STATION	LOCATION
1	Brazoria	2	06L8	SH0036 NW OF
WEST COLUMBIA				
2	Brazoria	2	06L4	SH0036 NW OF
WEST COLUMBIA				
3	Brazoria	2	11L1*	SH0288 S OF
HOUSTON				
4	Brazoria	2	11L5*	SH0288 S OF
HOUSTON				
5	Brazoria	2	2031*	.8MI N SH227
ANGLETON				
6	Brazoria	2	2035*	.8MI N SH227
ANGLETON				
7	Brazoria	6	02L7*	SH0035 SW OF
WEST COLUMBIA				
8	Brazoria	6	02L2*	SH0035 SW OF
WEST COLUMBIA				
9	Brazoria	7	02L5	SH0035 SW OF
WEST COLUMBIA				
10	Brazoria	8	02L8	SH0035 SW OF
WEST COLUMBIA				
11	Fort Bend	1	03L3	IH0010 W OF
HARRIS C/L				
12	Fort Bend	1	03L7	IH0010 W OF
HARRIS C/L				
13	Fort Bend	2	04L2	US0090A SW OF
SUGARLAND				
14	Fort Bend	2	04L6	US0090A SW OF
SUGARLAND				
15	Fort Bend	12	05L2*	US0059 SW OF
HOUSTON				
16	Fort Bend	12	05L6*	US0059 SW OF
HOUSTON				
17	Fort Bend	14	01L4*	SH06 SW OF
HOUSTON				
18	Fort Bend	14	01L8*	SH06 SW OF
HOUSTON				
19	Galveston	11	2044	S END
GALVESTON CAUSEWAY BR				
20	Galveston	11	2048	S END
GALVESTON CAUSEWAY BR				
21	Galveston	14	10L3*	SH0006 NW OF
GALVESTON				
22	Galveston	14	10L7*	SH0006 NW OF

GALVESTON				
23	Galveston	16	8414*	53RD ST SE OF
SH 87				
24	Galveston	16	8418*	53RD ST SE OF
SH 87				
25	Hardin	2	04T3	US0096 E OF
SILSBEE				
26	Hardin	2	04T7	US0096 E OF
SILSBEE				
27	Hardin	2	9583*	SH 105 WEST OF
SH 326				
28	Hardin	2	9587*	SH 105 WEST OF
SH 326				
29	Hardin	2	E183*	SH0105 E OF
MOSS HILL				
30	Hardin	2	E187	SH0105 E OF
MOSS HILL				
31	Hardin	7	0861	3.7MI N FM
1122 SILSBEE				
32	Hardin	7	0865	3.7MI N FM
1122 SILSBEE				
33	Harris	2	0033	4.8 MI W OF
FM1960 HOUSTON				
34	Harris	2	0037	4.8 MI W OF
FM1960 HOUSTON				
35	Harris	6	90L2*	US0090 NE OF
HOUSTON				
36	Harris	6	90L6*	US0090 NE OF
HOUSTON				
37	Harris	11	3161	.5MI N FM1960
HOUSTON				
38	Harris	11	3165	.5MI N FM1960
HOUSTON				
39	Harris	11	8451	IH 45 NORTH OF
LOOP 8				
40	Harris	11	8455	IH 45 NORTH OF
LOOP 8				
41	Harris	11	8493	IH 10 WEST OF
SH 6				
42	Harris	11	8497	IH 10 WEST OF
SH 6				
43	Harris	11	8503	IH 10 EAST OF
WIRT ST.				
44	Harris	11	8507	IH 10 EAST OF
WIRT ST.				
45	Harris	11	8511	IH 610 NORTH
OF IH 10				
46	Harris	11	8515	IH 610 NORTH

OF IH 10				
47 Harris	11	8523	IH 610 EAST OF	
SPUR 261				
48 Harris	11	8527	IH 610 EAST OF	
SPUR 261				
49 Harris	11	8533	IH 610 WEST OF	
FM 521				
50 Harris	11	8537	IH 610 WEST OF	
FM 521				
51 Harris	11	8541	IH 610 NORTH	
OF US 59				
52 Harris	11	8545	IH 610 NORTH	
OF US 59				
53 Harris	11	8571	IH 45 SOUTH OF	
FM 528				
54 Harris	11	8575	IH 45 SOUTH OF	
FM 528				
55 Harris	11	8551	IH 45 NORTH OF	
SH 3				
56 Harris	11	8555	IH 45 NORTH OF	
SH 3				
57 Harris	11	8561	IH 45 NORTH OF	
IH 10				
58 Harris	11	8565	IH 45 NORTH OF	
IH 10				
59 Harris	11	8441	IH 45 SOUTH OF	
SPUR 261				
60 Harris	11	8445	IH 45 SOUTH OF	
SPUR 261				
61 Harris	11	8593	IH 610 WEST OF	
IH 45				
62 Harris	11	8597	IH 610 WEST OF	
IH 45				
63 Harris	11	8603	IH 10 EAST OF	
US 59				
64 Harris	11	8607	IH 10 EAST OF	
US 59				
65 Harris	11	1253	8.7MI W SH146	
HOUSTON				
66 Harris	11	1257	8.7MI W SH146	
HOUSTON				
67 Harris	12	8421	US 59 WEST OF	
SH 288				
68 Harris	12	8425	US 59 WEST OF	
SH 288				
69 Harris	12	8433	US 290 WEST OF	
IH 610				
70 Harris	12	8437	US 290 WEST OF	

IH 610				
71 Harris	12	8461	US 59 SOUTH OF	
FM 1960				
72 Harris	12	8465	US 59 SOUTH OF	
FM 1960				
73 Harris	12	8471	US 59 SOUTH OF	
IH 10				
74 Harris	12	8475	US 59 SOUTH OF	
IH 10				
75 Harris	12	08L1*	SH0146 1 MI N	
OF NASA 1				
76 Harris	12	08L5*	SH0146 1 MI N	
OF NASA 1				
77 Harris	12	1072	N END BAYTOWN	
TUNNEL BAYTOW				
78 Harris	12	1075	N END BAYTOWN	
TUNNEL BAYTOW				
79 Harris	12	8583	SH 225 WEST OF	
LOOP 8				
80 Harris	12	8587	SH 225 WEST OF	
LOOP 8				
81 Harris	12	09L4	SH0300 NW OF	
BAYTOWN				
82 Harris	12	09L8	SH0300 NW OF	
BAYTOWN				
83 Harris	14	8481*	SH 35 AT W P	
HOBBY AIRPORT				
84 Harris	14	8485*	SH 35 AT W P	
HOBBY AIRPORT				
85 Harris	14	07L1*	SH0035 S OF	
HOUSTON				
86 Harris	14	07L5*	SH0035 S OF	
HOUSTON				
87 Harris	14	8613	FM 1960 EAST	
OF IH 45				
88 Harris	14	8617	FM 1960 EAST	
OF IH 45				
89 Harris	14	8621*	SH 6 SOUTH OF	
IH 10				
90 Harris	14	8625*	SH 6 SOUTH OF	
IH 10				
91 Jefferson	1	07T2	IH0010 NEAR	
CHAMBERS CO LIN				
92 Jefferson	1	07T6	IH0010 NEAR	
CHAMBERS CO LIN				
93 Jefferson	11	9613	IH 10 EAST OF	
US 69				
94 Jefferson	11	9617	IH 10 EAST OF	

US 69				
95	Jefferson	14	9634*	US 90 NORTH OF
SPUR 380				
96	Jefferson	14	9638	US 90 NORTH OF
SPUR 380				
97	Jefferson	14	10T2*	SH0087 NE OF
PORT ARTHUR				
98	Jefferson	14	10T6*	SH0087 NE OF
PORT ARTHUR				
99	Jefferson	14	9624	FM 366 NORTH
OF FM 365				
100	Jefferson	14	9628	FM 366 NORTH
OF FM 365				
101	Liberty	2	01T7	SH0105 SE OF
LIVINGSTON				
102	Liberty	2	01T3	SH0105 SE OF
LIVINGSTON				
103	Liberty	6	E171	SH0146 S OF
TYE				
104	Liberty	6	E175	SH0146 S OF
TYE				
105	Liberty	6	01T1	SH0105 SE OF
LIVINGSTON				
106	Liberty	6	01T5	SH0105 SE OF
LIVINGSTON				
107	Liberty	6	05T1*	SH0146 S OF
DAYTON				
108	Liberty	6	05T5*	SH0146 S OF
DAYTON				
109	Montgomery	1	8641	IH 45 SOUTH OF
SH 242				
110	Montgomery	1	8645	IH 45 SOUTH OF
SH 242				
111	Montgomery	11	8651	IH 45 SOUTH OF
LOOP 336				
112	Montgomery	11	8655	IH 45 SOUTH OF
LOOP 336				
113	Montgomery	12	1742*	4.0MI S FM1314
HOUSTON				
114	Montgomery	12	1746*	4.0MI S FM1314
HOUSTON				
115	Orange	1	1173*	E. END NECHES
R BG BEAUMONT				
116	Orange	1	1177	E. END NECHES
R BG BEAUMONT				
117	Orange	1	9643*	IH10 WEST OF
ORANGE				
118	Orange	1	9647*	IH10 WEST OF

ORANGE				
119	Orange	6	09T1	SH0105 W OF
ORANGE				
120	Orange	6	09T5	SH0105 W OF
ORANGE				
121	Orange	6	09T7	SH0105 W OF
ORANGE				
122	Orange	6	09T3	SH0105 W OF
ORANGE				
123	Orange	11	06T3	IH0010 AT
LOUISIANA ST LINE				
124	Orange	11	06T7	IH0010 AT
LOUISIANA ST LINE				

Sites are opposite directional pairs. Last digit of Station Id is direction code. Astrick (*) indicates data collected at this location under this task (i.e., Phase I).

Table 2
Phase I Supplemental Vehicle Classification Data Collection
Sites Used in Phase I Interim Analysis

OBS	COUNTY	FC	STATION	LOCATION
1	Brazoria	2	11L1	SH0288 S OF
HOUSTON				
2	Brazoria	2	11L5	SH0288 S OF
HOUSTON				
3	Brazoria	2	2031	.8MI N SH227
ANGLETON				
4	Brazoria	2	2035	.8MI N SH227
ANGLETON				
5	Brazoria	6	02L7	SH0035 SW OF
WEST COLUMBIA				
6	Brazoria	6	02L2	SH0035 SW OF
WEST COLUMBIA				
7	Galveston	14	10L3	SH0006 NW OF
GALVESTON				
8	Galveston	14	10L7	SH0006 NW OF
GALVESTON				
9	Galveston	16	8414	53RD ST SE OF
SH 87				
10	Galveston	16	8418	53RD ST SE OF
SH 87				
11	Hardin	2	9587	SH 105 WEST OF

SH 326				
12 Hardin	2	E183	SH0105 E OF	
MOSS HILL				
13 Harris	6	90L2	US0090 NE OF	
HOUSTON				
14 Harris	14	8481	SH 35 AT W P	
HOBBY AIRPORT				
15 Harris	14	8485	SH 35 AT W P	
HOBBY AIRPORT				
16 Harris	14	07L1	SH0035 S OF	
HOUSTON				
17 Harris	14	07L5	SH0035 S OF	
HOUSTON				
18 Jefferson	14	9634	US 90 NORTH OF	
SPUR 380				
19 Jefferson	14	10T2	SH0087 NE OF	
PORT ARTHUR				
20 Jefferson	14	10T6	SH0087 NE OF	
PORT ARTHUR				
21 Liberty	6	05T1	SH0146 S OF	
DAYTON				
22 Liberty	6	05T5	SH0146 S OF	
DAYTON				
23 Montgomery	12	1742	4.0MI S FM1314	
HOUSTON				
24 Montgomery	12	1746	4.0MI S FM1314	
HOUSTON				
25 Orange	1	1173	E. END NECHES	
R BG BEAUMONT				

Sites are opposite directional pairs. Last digit of Station Id is direction code.

Table 3
Summary VMT Mix Estimate Using Phase I Supplemental Vehicle Classification Data

OBS	TOTAL	DAY	FC	P LDGV	P LDDV	P LDGT12	P LDGT34	P LDDT	P HDDV	P HDGV	P BUS
1	168,087	Fr	Art	0.5165397	0.0011838	0.2359842	0.0482996	0.0013261	0.1167463	0.0659210	0.0129992
2	73,255	Fr	Fwy	0.5027515	0.0011522	0.2659049	0.0574151	0.0014943	0.1006209	0.0541262	0.0155348
3	146,347	Sa	Art	0.5385573	0.0012341	0.2441641	0.0497059	0.0013721	0.0993542	0.0560504	0.0085618
4	57,631	Sa	Fwy	0.4879847	0.0011185	0.2703542	0.0533311	0.0015193	0.1079713	0.0597857	0.0169353
5	111,258	Su	Art	0.5478972	0.0012555	0.2474339	0.0499686	0.0013905	0.0916809	0.0518234	0.0075500
6	47,809	Su	Fwy	0.5059758	0.0011596	0.2799345	0.0553652	0.0015731	0.0911979	0.0507628	0.0130310
7	282,708	Wk	Art	0.4911448	0.0011257	0.2265610	0.0470165	0.0012732	0.1345152	0.0777851	0.0195785
8	83,312	Wk	Fwy	0.4752651	0.0010894	0.2543060	0.0537118	0.0014291	0.1228969	0.0671237	0.0231779
=====											
	970,407										

Table 4
VMT Mix Estimate Using Phase I Supplemental Vehicle Classification Data

OBS	TOTAL	DAY	FC	P LDGV	P LDGT1	P LDGT2	P LDGT3	P LDGT4	P HDGV2B	P HDGV 3	P HDGV 4
1	168,087	Fr	Art	0.5165397	0.0545128	0.1814715	0.0330850	0.0152146	0.0338175	0.0127228	0.0058670
2	73,255	Fr	Fwy	0.5027515	0.0614245	0.2044804	0.0393291	0.0180860	0.0277667	0.0104464	0.0048172
3	146,347	Sa	Art	0.5385573	0.0564023	0.1877618	0.0340483	0.0156576	0.0287539	0.0108177	0.0049885
4	57,631	Sa	Fwy	0.4879847	0.0624523	0.2079019	0.0365316	0.0167995	0.0306700	0.0115386	0.0053209
5	111,258	Su	Art	0.5478972	0.0571576	0.1902762	0.0342283	0.0157403	0.0265854	0.0100019	0.0046123
6	47,809	Su	Fwy	0.5059758	0.0646653	0.2152692	0.0379249	0.0174403	0.0260413	0.0097972	0.0045179
7	282,708	Wk	Art	0.4911448	0.0523360	0.1742250	0.0322061	0.0148104	0.0399038	0.0150125	0.0069229
8	83,312	Wk	Fwy	0.4752651	0.0587451	0.1955609	0.0367923	0.0169194	0.0344345	0.0129549	0.0059740
=====											
	970,407										

OBS	P HDGV 5	P HDGV 6	P HDGV 7	P HDGV8A	P HDGV8B	P LDDV	P LDDT12	P HDDV2B	P HDDV 3	P HDDV 4
1	0.0025050	0.0060647	0.0024391	0.0022413	0.0002637	0.0011838	0.0002153	0.0295368	0.0154105	0.0089895
2	0.0020568	0.0049796	0.0020027	0.0018403	0.0002165	0.0011522	0.0002426	0.0254571	0.0132820	0.0077478
3	0.0021299	0.0051566	0.0020739	0.0019057	0.0002242	0.0012341	0.0002227	0.0251366	0.0131148	0.0076503
4	0.0022719	0.0055003	0.0022121	0.0020327	0.0002391	0.0011185	0.0002466	0.0273167	0.0142522	0.0083138
5	0.0019693	0.0047678	0.0019175	0.0017620	0.0002073	0.0012555	0.0002257	0.0231953	0.0121019	0.0070594
6	0.0019290	0.0046702	0.0018782	0.0017259	0.0002031	0.0011596	0.0002554	0.0230731	0.0120381	0.0070222
7	0.0029558	0.0071562	0.0028780	0.0026447	0.0003111	0.0011257	0.0002067	0.0340324	0.0177560	0.0103577
8	0.0025507	0.0061754	0.0024836	0.0022822	0.0002685	0.0010894	0.0002320	0.0310929	0.0162224	0.0094631

OBS	P HDDV 5	P HDDV 6	P HDDV 7	P HDDV8A	P HDDV8B	P MC	P HDGB	P HDDBT	P HDDBS	P LDDT34
1	0.0058373	0.0185627	0.0122584	0.0207808	0.0053703	0.0010000	0.0026581	0.0042289	0.0061123	0.0011109
2	0.0050310	0.0159987	0.0105652	0.0179105	0.0046286	0.0010000	0.0031765	0.0050538	0.0073045	0.0012517
3	0.0049677	0.0157973	0.0104322	0.0176850	0.0045703	0.0010000	0.0017507	0.0027853	0.0040258	0.0011494
4	0.0053986	0.0171674	0.0113370	0.0192189	0.0049667	0.0010000	0.0034629	0.0055094	0.0079630	0.0012726
5	0.0045840	0.0145773	0.0096265	0.0163192	0.0042173	0.0010000	0.0015438	0.0024562	0.0035500	0.0011647
6	0.0045599	0.0145005	0.0095758	0.0162332	0.0041951	0.0010000	0.0026646	0.0042392	0.0061272	0.0013177
7	0.0067258	0.0213879	0.0141241	0.0239437	0.0061877	0.0010000	0.0040034	0.0063693	0.0092059	0.0010665
8	0.0061448	0.0195406	0.0129042	0.0218756	0.0056533	0.0010000	0.0047394	0.0075402	0.0108983	0.0011971